

Art, Museums and Contests: Private vs. Public Provision

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This paper examines revenue-raising competition among art museums when the government gives matching grants to one of them. Matching grants are complementary to revenues raised by the museums. Revenue-raising and revenue-spending activities of the museums are assumed to generate positive externalities to society. This paper derives Nash equilibrium revenues raised by the museums. The outcome is then compared with the socially optimal level of the revenues. Depending upon the type of social welfare function and the extent of externalities, the revenues raised by the museums can be greater than, equal to, or smaller than the social optimum. This paper also discusses the role of the matching mechanism of the government with which the Nash equilibrium can be equated to the social optimum.

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I. Introduction

Art museums and art galleries are confronted by several serious problems. First of all, most of them face serious financial problems. There is also a growing concern that the public services provided by

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individuals. Many arguments are also centered on the role of government in providing subsidies to art museums and galleries.

The purpose of this paper is to examine revenue-raising competition among museums when the government gives matching grants to one of them. Revenue-raising and revenue-spending activities of the museums are assumed to generate positive externalities. We derive a Nash equilibrium, and then compare it with the socially optimal level of non-governmental revenues. Depending upon the type of social welfare function and the extent of externalities, the revenues raised by the art museums can be greater than, equal to, or smaller than the social optimum. This paper also considers the possibility of designing the matching mechanism with which the Nash equilibrium is always identical to the social optimum. Two results of this paper are noteworthy: (i) The more active the government is, the more non-governmental revenues the art museums raise; (ii) when there are no externality effects, the level of revenue raised by the art museums is greater than the social optimum.

This paper is organized as follows. Section II presents a general discussion on the economics of museums and the public policy towards them. We offer brief explanations on the role of art museums and differences between the European and American approach towards them. We also argue that matching grants given to the museums can be complementary to the revenues raised by the museums. Section III sets up the model of revenue-raising contest in which the government gives matching grant to one of the art museums. The Nash equilibrium is derived. It is then compared to the social optimal under different definitions of social welfare. Section IV offers concluding remarks.

II. Discussion on the Economics of Museums and Public Policy

The major issues reflecting the actual problems of art museums and galleries are as follows:

(i) First, the financial problem may be highlighted. It is unthinkable to separate the main activity of museums, which is to provide a public good in the form of art, from the revenue sources that are needed to fulfill their goals. In other words, "the finances of a

museum are integrally related to the scholarly, educational and aesthetic purposes of the institution" (Feldstein 1991, p. 66).

(ii) Second, related to its own revenues, there is a growing concern that art as a public good provided by art museums and galleries should reach a larger number of individuals. As we will emphasize throughout this paper, there are positive externalities from this public outcome that individuals can enjoy. Nevertheless, except for some special cases, in actual practice this trend is not observed. "Unlike other art venues (the theater, for example), art galleries cannot be accused of failing in their attempts to popularize themselves, when such attempts are scarcely ever even made" (Lewis 1990, p. 99).

(iii) Third, the role played by the government is an important issue related to art museums and galleries. Traditionally, the role of government in the provision of art has been oriented to subsidizing all the expenses (current or capital) of these institutions. In this sense, there has been a total dependency of the fine art institutions on the government. We believe that government policy has to be oriented to setting favorable conditions under which market rules can be applied to the art sector. Therefore, "no financial resources, or only minor ones, are required by measures that facilitate the formation of markets" and "governments are aimed at improving conditions for the production and sale of artistic creations, and at easing access for the demanders of art" (Frey and Pommerehne 1989, p. 181).

This paper sets up a framework that characterizes in a brief manner the foundations for the provision of this public good and the role that these institutions (museums or art galleries) play.

A. Framework

Two different models of the provision of public goods can be observed. On the one hand, there exists the more market-oriented model prevailing in the United States in which public financial support is very limited. On the other hand, in what we call the European model, public financial support is the main source of revenues for these institutions. In the European model, we find the following characteristics:

1. The museums depend on public subsidies.
2. They are not managed by market principles.
3. There does not exist a well-defined cost function encompassing

the “real” costs of the museum.

4. They are not interested in the revenues. Any potential deficit is automatically covered by public funds.
5. There are miscalculations and sometimes ignorance on the stock of objects that the museums have.
6. Directors and staffs are, in general, bureaucrats.

As a result, the following consequences are observed:

- a. Non-market decisions take control of the art museums.
- b. The government can decide whose work is to be exhibited. Some authors believe that, by doing so, it has created the “culture of the party” which holds the government at any given period of time.
- c. According to this model, everybody in this society is involved in the financing of art museums.
- d. The “perfect argument” justifying this is the necessity to preserve for future generations what is called *quality art*. The truth, however, is that not everybody benefits from this “art”. Those who benefit from this model are:
 - professionals
 - politicians/bureaucrats and people involved in the public administration
 - middle/upper social classes.
- e. Another argument justifying this model is based on the generation of (positive) externalities. In other words, there exist some benefit that museums might generate unintentionally, but with a social and economic impact that is difficult to internalize through market prices.

While the latter is true, and while there is no doubt that the museums do create these benefits as by-products of their own activity, these effects are also created by market-oriented museums as well. Therefore, only a certain part of public funds these museums earn are justified by the externalities. We could even argue that instead of being generic externalities, the large amount of externalities created by museums should be viewed as a neighborhood effect, since they are defined to local cities or particular territories. Nevertheless, other parts of them could be viewed as externalities in its pure sense.

There is yet another justification for this model. This deals with the real nature of the output provided by a museum. In other

words, what we have to provide is a merit good rather than a public good in a strict sense. No matter what the individual preference revelation for this good is, politicians are willing to support them, since art is regarded as an “especially good thing.”¹ Nevertheless, although we can think that these goods present a type of “intrinsic merit” that makes them different from the ordinary good, “this is not much an explanation in economic terms as it is a value judgment that lies outside the realm of economic discourse” (Heilbrun and Gray 1993, p. 220). So far, we consider this output as a public good, and the problem that can be established is the one about its public or voluntary provision.

If we analyze the nature of this public good, we observe that the non-rivalry principle is satisfied. In other words, they present a joint supply so that individuals may consume it in the same amount without having the problem that consumption could be reduced by other individuals’ consumption. On the other hand, the non-exclusion principle can also be satisfied as well as the generation of external effects. Nevertheless, some exclusion barriers can be implemented, so an impure public good can be defined. In this case, the degree of publicness and privateness will define properly what type of public good it is. Therefore, there is some room to implement methods of voluntary provision of this output and at the same time to obtain allocative improvements in Pareto terms.

B. The Bases for the Voluntary Provision of Art as a Public Good

Museums have a very well defined end objective. This objective is the keeping of stocks of paintings, sculptures and the likes, as well as providing services to the rest of the community. In other words, we consider art as a public good, not only the objects but also the services (for example, curators, storage, restoration, etc.) provided.

This approach requires putting the individual right in the center of analysis in order to solve a collective action problem. And it is the institution called the museum that encourages individuals to finance the public goods provided. In this sense, “people are assumed to behave rationally in the sense that they react

¹See Heilbrun and Gray (1993). Politicians are willing to support the arts even though they acknowledge that the resulting activity exceeds what consumers would demand if left to their own devices (p. 219).

systematically to changes or differences in constraints connected to particular institutions.”² Thus, we must assume that if any institutional change is produced in the art sector, it will not bring a radical alteration on the patterns of individual behavior. In our case, we do not think that increasing the volume of non-governmental revenues by the museums, in order to finance the provision of this public good, will impose any radical change. On the contrary, a much more accurate preference revelation about this good will be generated, which might indicate a more efficient allocation of resources. Moreover, no reduction of the positive externalities will be incurred.

In this sense, we argue that contests can play an important role that art galleries and museums need. It can also be a good system to popularize art. As its consequence, we would observe the following:

- Museums may increase and emphasize the generation of (positive) external effects, or neighborhood effects.
- The staff would be more involved in the work done in the museum. More preparation in running museums would be required.
- The museum stocks would be mobilized and, therefore, more personnel would be needed.
- Museums need to increase collective action decisions, rather than coercive decisions.

A generalization of contests (encouraged by prizes) among museums would create a more spread-out alternative business than it is known right now. Finally, a whole market for exhibitions can be created, and for art in particular. Museums would be encouraged to withdraw some of their facilities or collections managed by professionals. Besides, stocks could be taken out of storage rooms where they do not produce anything (neither an external effect for the ones visiting the museum).

Probably, a new type of demand would also be created. For example, there are minor museums all over the country that are usually poorly run by bureaucrats without any incentive to do “new” things, simply because a market for art exhibitions does not exist. If the collections were mobilized, these minor museums would at least have the chance to compete in exhibiting them. It would

²See Frey (1994, p. 325).

mean more private earnings for the museums. The opportunity cost to do this is not high. Besides, the costs and benefits can be measured easily. And instead of having excellent paintings and sculptures covered by dust in warehouses, the museums should arrange (through a good managerial and professional team) exhibitions to go around the country and to other parts of the world. This would increase the competition among museums in trying to obtain these exhibitions. Finally, could a real market of contests be created? At least, initially, this new income source would be complementary to public funds (although the final aim is to become an alternative to public funds). And probably, the externalities generated would even justify public prizes for the museums.

On the other hand, other sources of revenues can increase as well. Since individuals cooperate in a rational way, and since we could argue that they are motivated by *rationally oriented limited altruism*, donations can be raised in higher amounts. Individuals can be encouraged to contribute by the satisfaction that culture and art are finally reaching a higher volume of people. These people consume this public good that generates positive external benefits for social well-being. Donors can as well be satisfied by the effect that their "own" financial resources are being well employed, and that the often changing of collections or taking them outside (to other museums, galleries, etc.) as well as bringing in new ones, increase personal satisfaction.³ It is not the same for the individual that contributes under a *forced cooperation syndrome* situation (otherwise the museum can be shut down at the extreme case) rather than to contribute to *an economically successful social cause*. It is in this context that impure altruism might have a relevant role.

Then, what is the role of the government to implement or impulse this performance of the museums? To increase the

³It is Andreoni (1988, 1990) who puts to work the concept of impure altruism to explain that there might be a "warm-glow" effect associated with giving. See also for example, Andreoni (1993): "Individuals get pleasure (...) from the act of contributing to the public good" (p. 1325). Or in the same line, Jones, Cullis and Lewis (1998): "Motivation is now more self-interested (...) in a narrower fashion than implied by the interdependent utility function." They even cite, among others, the following arguments to justify individual cooperation: (a) reputation of the donors; (b) response to fund-raising; and (c) personal investment (p. 7).

commercial activity of the museum and, which is a consequence of the increase in fundraising, it is assumed that voluntary donations can increase as well. We can argue that government policy should be directed towards encouraging the potential contestants (museums) through prizes that increase non-governmental revenues,⁴ instead of an absolute dependency on the public budget. To achieve this goal we argue that government should devise a prize (S) in the way of a “matching funds game.” Some consequences and in general those named as externalities of this contest can be observed:

- A reduction in the dependency of public funds.
- An increase in competition among museums.
- An increase in the number of visitors to the museum.
- An increase in museum attendance to the rest of museums.
- Expansion of education and culture throughout different social classes.
- Reduction in, and in the best case elimination of rent seeking activities and social waste.
- Achievement of the aim of popularizing art galleries and museums.

Is there a conflict of (vested) interests between continuing as in the old-fashioned way (public resources) and the new one (non-governmental revenues except for a *public complementary funds* in a matching grant system)? In the European model, depending essentially on public funds, political interests and non-market decisions arise. Sometimes these interests are related to art, museums or the economic situation of the institution. Besides, this way of financing museums results in a rather unfair income distribution. That is, all citizens, whether they like exhibitions or not, pay for it. Meanwhile only some well-educated individuals of middle/upper-middle/upper classes enjoy this public good called art.

In the market-oriented American model, individual decisions sustain the institution. Therefore the problem that arises is the one of supply and demand and how to adjust both through outputs and prices. In this model public funds are not rejected. On the

⁴We understand by non-governmental revenues, on the one hand the commercial activities: (a) fees and box office; (b) cafeteria and restaurant; (c) shop sells (all type of items, posters, etc.); (d) catalogs; (e) publicity contracts and sponsors either permanent or for particular events; and (f) others, and on the other hand, fundraising efforts: (a) voluntary contributions or donations; (b) memberships programs; (c) corporate donations; and (d) others. Selling assets is considered in this paper for other purposes.

contrary, they can even improve the well being of the institution. In other words, public funds can play a complementary role to this institution in increased competition, the number of exhibition done year around, and therefore increase in the number of attendance (demand) who spend money and increase in non-governmental income source to sustain the institution. Could this complementary public funds be applied in the same way for the European model? This is the question that contests might address.

III. The Model of Contest among Museums and Government Grant

Once the framework is established, the problem is how to encourage the voluntary provision of a public good. In other words, what has to be analyzed is the implementation of non-governmental revenue sources, whether they are commercial activities or fundraising efforts to increase voluntary donations. In the **American model** there is no initial problem in applying a prize (S) “matching grant system” since the bases for this voluntary provision are already established. Therefore, a simple contest among the museums to obtain the prize can be introduced. The consequences of this contest are similar to the ones analyzed in Lee and Garcia-Sobrecases (1998).⁵ In the **European model**, however, there is an additional problem. Since the model is based in an almost exclusive manner on the public provision of a public good (absolute dominance of governmental funds), we need first to create pre-conditions to enable changes from this system to a *new* one based on prizes. During the transitory period, the government may distribute its funds in two different parts:

- (a) Matching non-governmental revenues. This would be the normal prize (S) as designed for the former case.
- (b) An endowment (α) limited in time and decreasing over time. This part is designed to apply during the transitory process. This endowment must be added to non-governmental revenues obtained by the museums.⁶

⁵Note that this model applies perfectly for the cases where revenues to sustain the museum activity are voluntary contributions. Fundraising efforts are made in order to increase donations, so any public prize (S) works to raise these donations.

⁶In this paper a special case of endowment is presented. In particular, α

To do the latter, we suppose that in the European model the necessary institutional changes have taken place. We believe that it is necessary to move toward the *new* model, since social waste associated with rent seeking in the European model diminishes the social benefits that museums might generate.

The prize (S) is given as

$$S = \frac{X}{N} \cdot \delta,$$

where $X (= \sum x_i)$ denotes the summation of all non-governmental revenues obtained by the N existing museums in this model. The parameter δ ($0 \leq \delta \leq 1$) represents government policy. Thus, if the government wants to increase the prize (S), to give incentive to the contestants to produce more non-governmental funds, then δ approaches 1. If δ approaches 0, we expect the opposite effect. On the other hand α denotes an endowment given by the government in a discrete way during the transitory period. α is given by the following:

$$\alpha = \beta (x_0 - \omega_i),$$

where $0 \leq \beta \leq 1$. x_0 is the minimum operative costs of the museum, while ω_i represents the expected amount of non-governmental revenues. This endowment must be given initially in the European model, since not much of private funds are expected to be available to the museums. However, once ω_i approaches x_0 we observe that α goes to 0. If the government observes that, in any of these museums, strategic behaviors⁷ are directed toward the aim that ω_i does not rise "fast" to reach x_0 , then α can be equal to zero by just setting $\beta = 0$. As mentioned before, the mission of this endowment extinguishes once $\omega_i = x_0$. When this goal is achieved, the contest among museums in the European model might produce the same outcome as in the American model.

We want to change the way in which the museums are run in

corresponds to a lump sum amount to be further explained shortly.

⁷We understand by strategic behavior the way some of the museums (contestants) might behave. In particular, they realize that governmental endowment (α) is earned while not reaching the minimum x_0 , determined above. It is then a maximizing strategy for the museum not to increase these revenues. In doing so, the transitory endowment will be earned for more periods than expected initially. Probably, the museum assumes that it is less costly to earn α rather than to increase x_i .

the provision of art. We will observe that a contest for prize (S) offers incentives for the museums to increase the amount of non-governmental revenues. On the other hand, for the European model with full subsidies, we need to introduce another public subsidy (α) which is designed to be useful during the transitory period. The museum will reach a level of non-governmental revenues (x_i) higher than (or equal to) the level necessary to sustain all the operative costs. Once reaching this level (even when β is constant) it will be more profitable to run for the prize (since α is not taken into consideration in S) through increasing beyond x_0 , the non-governmental revenues.

Let $g(x_i)$ denote the costs of museum i to raise non-governmental revenues. In other words, increasing commercial activity and therefore fundraising is costly for any museum. We assume all the museums have the same cost function. As in Lee and Garcia-Sobrecases (1998) this function is further assumed to possess the following characteristics:

$$g'(x_i) = \frac{dg(x_i)}{dx_i} > 0, \quad (A1)$$

$$g''(x_i) > 0, \quad (A2)$$

$$\lim_{x_i \rightarrow 0} g'(x_i) = 0, \quad (A3)$$

$$g(0) = 0. \quad (A4)$$

The assumptions (A1) to (A4) are easy to understand. The cost for the museum is assumed to be zero with no non-governmental revenues, [(A4)]. To obtain more non-governmental revenues museums should incur cost, [(A1)]. Note also that unit cost of raising revenues remains growing. Of course, costs of raising these revenues grow slower when those revenues are sufficiently small than when they are very large.

A. The Model of Government Matching Grant

We set up the model of contest between museums for a government grant.⁸ The government gives grant S to one of the

⁸Nitzan (1994) offers a survey of recent literature on the theory of contest. More recently, two volumes of papers on contest have been published. See *European Journal of Political Economy* (1998) and Baye (1998).

museums. Or, alternatively, the government distributes the grant among the museums. Following Tullock (1980), the probability that museum i obtains the government grant, or a share of the grant to museum i , is given by

$$\Pi_i = \frac{x_i}{X}.$$

The more funds raised by museum i , the higher the probability that it obtains the grant. The prize is complementary to the non-governmental revenues raised by the museum.⁹ The prize encourages them to become more active in obtaining revenues. As mentioned before, the size of the prize is given by

$$S = \frac{X}{N} \cdot \delta.$$

Note that the role of government is parameterized by δ . In the case when $\delta = 1$, one of the museums would receive, in the symmetric equilibrium, the same amount as it has raised. That is, the equal matching fund is given to one of them.

The objective of the risk-neutral museum i is to maximize the expected value V_i given by

$$V_i = \Pi_i \{(x_i + \alpha) + S - g(x_i)\} + (1 - \Pi_i) \{(x_i + \alpha) - g(x_i)\}. \quad (1)$$

Note that the transitory endowment α is suitably taken into account. Substituting the values defined above, we obtain

$$V_i = \frac{x_i}{X} \{(x_i + \alpha) + \frac{X}{N} \cdot \delta - g(x_i)\} + (1 - \frac{x_i}{X}) \{(x_i + \alpha) - g(x_i)\}. \quad (2)$$

Rearranging this, the objective of museum i can be rewritten as

$$\text{Max } V_i = \frac{x_i}{N} \cdot \delta + (x_i + \alpha) - g(x_i), \quad \text{with respect to } x_i. \quad (3)$$

Note that α can be treated as a constant when analyzing museum i 's decision on non-governmental revenue-raising.¹⁰ At an interior

⁹We assume, as mentioned above, that all non-governmental revenues of the museums are homogeneous, no matter where they come from. In this analysis, we are not interested in distinguishing voluntary contributions from commercial activities that museums implement. In fact, we assume that voluntary contributions can rise with increased commercial activity.

¹⁰Note that $\alpha = \beta(x_0 - \omega_i)$, where ω_i is initial non-governmental revenue. From each museum's point of view, however, α can be treated as given. In a more realistic model, α can be related to x_i and not to the expected

solution, the first-order condition is satisfied.

$$\frac{\partial V_i}{\partial x_i} = \frac{\delta}{N} + 1 - g'(x_i) = 0. \quad (4)$$

Thus, it immediately follows that

$$g'(x_i) = \frac{\delta}{N} + 1. \quad (5)$$

From (A1), $g'(x_i) > 0$. For a given number of museums N , the higher $g'(x_i)$, the higher δ is. In other words, the non-governmental revenues x_i rise when the government actively engage in grant-giving. We report the following observations.

Observation 1

The more active the government is, the more non-governmental revenues the museums raise.

Observation 2

The level of α has no effect on non-governmental revenues raised by the museums.

Observation 2 immediately follows from the fact that α does not affect the first-order condition. What it implies is the fact that the level of subsidies α necessary to run the museums during the transitory period should be kept to a minimum since it has no effect on non-governmental revenues.

B. Optimal Social Level and Externalities

The next step is to compare the level of voluntary contributions with the socially optimal level. As in Lee (1998) and Lee and Kang (1998), we assume that activities of raising and spending revenues generate positive externalities. They may increase the educational level of individuals, give them alternatives for leisure time, provide a good reputation to the host city, expand the market for arts, reduce delinquency, and so on. These externalities should be suitably accounted for when examining social welfare. As in Lee and Garcia-Sobrecases (1998), we consider three types of social welfare function given as follows:

$$(I) \quad W^I = f(X) - \sum_i g(x_i),$$

initial value ω_i . We do not consider this possibility to make the analysis as simple as possible.

$$(II) \ W'' = X + f(X) - \sum_i g(x_i), \text{ and}$$

$$(III) \ W''' = X - \sum_i g(x_i),$$

where $f(X)$ indicates the externalities created when the museums are involved in raising non-governmental revenues. Only externalities net of revenue-raising costs count in the first definition of social welfare, W^I . In the second definition W'' , increasing non-governmental revenues also constitute social welfare. We adopt the following assumptions on $f(\cdot)$:

$$f'(X) > 0, \quad (A5)$$

$$f''(X) \leq 0, \quad (A6)$$

$$\lim_{X \rightarrow 0} f'(X) = \infty, \quad (A7)$$

$$f(0) = 0. \quad (A8)$$

The meanings of these assumptions are transparent. When there are no fund-raising efforts and therefore with no non-governmental revenues, no externalities will be generated in this context. On the contrary, when there is fund-raising effort and non-governmental funds start rising, externalities start rising as well. We do not expect that these externalities rise faster than non-governmental revenues. Once those funds reach a certain level, the external effects refrain its own growth compared with those ones.

C. Welfare Function with Full Externalities

Note that in the welfare function W^I , X is regarded as a mere transfer between museums and individuals. In other words, what individuals contribute to museums via box-office or donation (as can be the case) is transformed into more provision of the art, so we can argue that welfare must be the same at a social aggregate level. Using symmetry, W^I is rewritten as

$$W^I = f(X) - N \cdot g\left(\frac{X}{N}\right). \quad (6)$$

The social optimum level of non-governmental revenues X^* maximizes $W^I = f(X) - N \cdot g(X/N)$. The first-order condition for maximization of W^I is

$$\frac{\partial W^I}{\partial X} = f'(X) - g'\left(\frac{X}{N}\right) = 0. \quad (7)$$

For a given number of museums N , equation (7) implicitly defines the social optimum X^* .

The important question is to compare the amount of Nash equilibrium fundraising X^N with the social optimum X^* . The social optimum indicates that the marginal cost of raising non-governmental revenues by museums must be equal to the marginal generation of external effects. At the social optimum

$$f'(X^*) = g'\left(\frac{X^*}{N}\right). \quad (8)$$

On the other hand, at the Nash equilibrium we observe that

$$f'(X^N) - g'\left(\frac{X^N}{N}\right) = f'(X^N) - \left(\frac{\delta}{N} + 1\right), \quad (9)$$

which can be either positive or negative. This indeterminacy is rather natural since Nash equilibrium is not related to the curvature of $f(X)$. While the social optimum level of non-governmental revenues X^* indicates that all externalities have been internalized, the government policy of supporting a high level of these revenues is fully justified. A higher δ would indicate a higher prize S to increase non-governmental revenues and sustain this social optimum level X^* . The expression (9) can be either positive or negative. However, the government can induce the Nash equilibrium to converge to the social optimum by adjusting the value of δ . That is, δ can be suitably chosen so that

$$f'(X^N) - \left(\frac{\delta}{N} + 1\right) = 0. \quad (10)$$

Rearranging equation (10) for δ , we obtain

$$\delta^* = N[f'(X^N) - 1]. \quad (11)$$

Even though equation (11) is not a reduced form of δ^* , it still gives valuable information about δ^* . It can be easily shown that δ^* is unique. If the government sets the prize equal to $(X^N/N)\delta^*$, then the Nash equilibrium is identical to the social optimum. When $f'(X^N) > 1$, the externality created by the museums is strong enough to guarantee a positive prize. In this case, the government should set a positive prize to increase fundraising. On the other hand, if $f'(X^N) = 1$, we observe that at Nash equilibrium externalities increase at the same rate as non-governmental revenues. In this case, government subsidy as a contest prize is not justified. That is, $\delta^* = 0$.

The last case, where $f'(X^N) < 1$, turns out to be a very peculiar

case. How should the government set the prize when externalities are low? In equation (11) we observe that δ is negative. This indicates that, instead of a prize, the government should impose a penalty (a tax) on the museums. In other words, the result is consistent with the public action when trying to encourage creating positive externalities or, on the contrary, when trying to correct a scenario of decreasing externalities. However, the analysis of this case is beyond the scope of the present paper. Moreover, this case does not exclude the possibility that positive endowments are given to the museums.

D. Welfare Function with Partial Externalities

We now consider the social welfare function given as

$$W'' = X + f(X) - \sum_i g(x_i). \quad (12)$$

In this case, the non-governmental revenues (X) are viewed as a component of social welfare. As in the former case exposed above, the first order condition for social optimum indicates that

$$\frac{\partial W''}{\partial X} = 1 + f'(X^*) - g' \left(\frac{X^*}{N} \right) = 0, \quad (13)$$

which yields

$$g' \left(\frac{X^*}{N} \right) = 1 + f'(X^*). \quad (14)$$

Note that the derivative of the cost of raising revenues is greater than the derivative of the externalities generated by the museums. In this case, the government must be more active than in the case described before, since the revenues museums raise constitute social welfare on its own. Nevertheless, we find the same problem as before when we try to compare it to the Nash Equilibrium. At the Nash equilibrium,

$$1 + f'(X^N) - g' \left(\frac{X^N}{N} \right) = f'(X^N) - \frac{\delta}{N}. \quad (15)$$

In this case

$$\lambda(\delta) = f'(X^N) - \frac{\delta}{N} = 0, \quad (16)$$

which gives the optimal δ^* . From equation (16) we obtain

$$\delta^* = N f'(X^N). \quad (17)$$

Since $f'(X) > 0$, it follows that $\delta^* > 0$. We do not know whether the Nash equilibrium outcome (non-governmental revenues that the museums obtain) will be equal to, greater than or smaller than the socially optimum level. Nevertheless, this case is more consistent with the museum framework than the one analyzed above. Increasing non-governmental revenues requires economic activity that generates net wealth and, at the same time, internalizes most of the externalities created. On the other hand, the externalities taken as such indicate that some more unintentional effects are derived from the performance of the museum.

E. The Special Case with No External Effects: Pareto Optimal Allocation in a Competitive Market?

In this special case, the social welfare function does not take externalities into account. Two reasons appear to justify this fact. (a) In the first place, we could argue that due to the increase in non-governmental revenues, the voluntary provision of art as such does not generate externalities. The reason might be that excludability mechanisms (other than prices) implemented by the museum are so perfect and efficient that all the effects can be internalized. (b) In the second place, we assume that the increase in non-governmental revenues is so large that all the possible externalities are completely internalized through the non-governmental revenue just raised. In particular we assume that market prices are a perfect mechanism to allocate economic resources.

The results in this case are in fact transparent. Without the externality terms, the social welfare is

$$W^{III} = X - \sum g\left(\frac{X}{N}\right). \quad (18)$$

The first order condition for the maximization of W^{III} is

$$\frac{\partial W^{III}}{\partial X} = 1 - g'\left(\frac{X}{N}\right) = 0, \quad (19)$$

which yields

$$g'\left(\frac{X^*}{N}\right) = 1. \quad (20)$$

At the Nash equilibrium the following condition is satisfied.

$$g'\left(\frac{X^N}{N}\right) = \frac{\delta}{N} + 1. \quad (21)$$

If $\delta > 0$, the slope of this cost function at the Nash equilibrium is higher than at the social optimum. The Nash equilibrium can be equated to the social optimum by simply setting $\delta = 0$, that is, by not giving any grant. Thus we obtain the following:

Observation 3

In the absence of externalities no government grant is required.

IV. Concluding Remarks

This paper has modeled revenue-raising competition among museums when the government gives matching grants to one of the museums or distributes grants among them. Revenue-raising and revenue-spending activities of the museums are assumed to generate positive externalities. We have derived the Nash equilibrium and have compared it to the socially optimal level of revenues. Depending upon the type of social welfare function and the extent of externalities, the revenues raised by the museums can be greater than, equal to, or smaller than the social optimum. The paper has also considered the possibility of designing the matching mechanism of the government with which the Nash equilibrium is always equated to the social optimum.

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